



TITLE OF THE INVENTION

Modular air spinning frame →

BACKGROUND OF THE INVENTION

The present invention relates, according to the preamble of the independent claims 1, 11 and 12, to a textile machine with several spinning places as well as different devices provided thereto.

Such devices are well known in textile technology. Such a device is, for example, (described) in the DE 42 12 701 C2. This document discloses a rotor spinning frame with a multiplicity of spinning places arranged next to each other, whereby each spinning place comprises a can feeding means, a spinning unit, and a winding device.

A disadvantage of a device according to the afore specified patent specification is, that in case of failures in the spinning unit or on the winding ~~up~~ unit, the entire spinning place is put out of operation.

The disclosed application DE 36 24 904 A 1 presents a generic different type of textile machine, that is, a cross bobbin winder that, according to a modular concept, consists of pre-assembled structural units. This cross bobbin winder can be re-fitted with the utilization of several standardized and pre-assembled structural units to create different types of ^{the} said cross bobbin winder. According to this state of the art, each structural unit or each structural group of components possesses, for the reciprocal position-accurate interconnection, prepared fastening means, position fixing means, and/or couplings for power conducting means. The modular concept is, therefore, known for cross bobbin winders. Cross bobbin winders perform a rewinding procedure which is substantially simpler than the spinning process in a spinning place, because the winding frame operates, contrary to the spinning frames, with a coherent, continuous thread. In the generic different texturing machines, for example, according to the DE 36 23 370 A 1 and DE 197 05 810 A 1, it is likewise known, to provide several modules for the machine. Contrary to spinning frames, texturing machines also operate with continuous and above all flexible filaments.

OBJECTS AND SUMMARY OF THE INVENTION

^{It} The present invention is, therefore, ^{of the present invention} based on the task to arrange the spinning places in such a manner that downtimes due to failures of machine components of the spinning place or during re-fitting of the spinning place are minimized. ^{Additional objects and advantages of the invention will be set forth in part in the following description, or may be obvious from the description, or may be learned through practice of the invention.}

5 The invention

^{This principal} The task of the invention is solved by way of the ^① characteristic features given in the independent patent claims 1, 11 and 12.

- 10 With the use of modular, structured and exchangeable spinning or winding up units, it is possible, during failures, and/or breakdowns of the devices mentioned, to interchange these simply and fast. With the replaceability ^{of these spinning or winding units} the downtimes are substantially reduced during such occurrences. The modular, structured and exchangeable spinning or winding up units have, in addition, still a further advantage. Owing to the modular
- 15 concept, one can produce thread with different spinning methods on the same textile machine. A spinning frame with such a modular concept is therefore applicable in many ways. Spinning places can produce different thread at the same time on the same machine. For example, thread ^{which} is produced with an air spinning method and thread ^{which} is produced with a rotor spinning method. Owing to the modular concept and the
- 20 replaceability ^{of these spinning units} one can refit the spinning places very fast, and, thus, produce threads faster and more ^{flexibly} according to customer requests. Such a textile machine, therefore, not only has lower downtimes, but also provides greater flexibility and lower cost of investment. The use of exchangeable winding up units, in addition, has the advantage that different types of windings ^{can be produced}, and/or different types of bobbins can be ^{used} produced.

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~~Favourable arrangements and types of embodiments of the invention are stated in the further dependent claims.~~

- In the following, the invention and the inventive thought are explained by way of an
- 30 exemplified embodiment illustrated in the figure. It is, however, to be pointed out expressly that the invention is not limited to this example.

BRIEF DESCRIPTION OF THE DRAWING

FIGURE 1 shows ^{a cross-sectional} a schematic view of a spinning place of a textile machine with a modular, structured and exchangeable spinning unit and winding unit.

* Reference will now be made in detail to the presently preferred embodiments of the invention, one or more examples of which are shown in the figures. Each example is provided to explain the invention and not as a limitation of the invention. In fact, features illustrated or described as part of one embodiment can be used with another embodiment to yield still a further embodiment. It is intended that the present invention cover such modifications and variations.

DETAILED DESCRIPTION

Figure 1 shows schematically (in the cross section) a spinning place of a textile machine

1. The textile machine 1 is double-sided, whereby the figure shows only one side of the machine (the dash-dotted line shows the axis of mirror inversion of the textile machine 1). Naturally, it would also be conceivable that the textile machine 1, shown in the figure,

5 is designed only one-sided. The spinning places of the textile machine 1 comprise a can feeding means ^{of can feeding device,} 2. The can feeding means ^{of can feeding device,} 2 can take up one or, as is illustrated in the figure, two cans 14. For the invention, it is thereby irrelevant whether one or more cans 14 are present and whether the can feeding means 2 is arranged within, next to, or in front of the spinning place. It would be also conceivable that one can feeding means 2 supplies several spinning units 3, and/or several spinning places with roving. This means that the invention covers also the possibility that a can feeding means 2 supplies several spinning places (for example two) with fibre material.

^{Typically,}
15 Typically for a spinning place is, however, that it comprises one spinning unit 3 and one winding ~~up~~ unit 4. According to the invention, the spinning unit 3 and the winding ~~up~~ unit 4 are modular structured and exchangeable (illustrated schematically in the figure). The term "modular" in the sense of the invention is to be understood in such a manner that these units form self-supporting, structural units, assembled from single components, which can be attached on, into, or at the textile machine frame 15 ^{of the textile machine}. By means of (not illustrated) ^{plug-in connections}, the spinning units 3 and the winding ~~up~~ units 4 can, as far as this is necessary, be supplied with electric power and compressed air from the machine frame 15, as well as with control signals from the central machine control unit 5. The modular concept of the units 3 and 4 also allow ^{that} different spinning or winding ~~up~~ units ^{to} can be mounted on the same textile machine frame 15. For example, different spinning units 3 can be provided ^{that} which, with regard to the applied spinning method, and/or thread formation method, comprise different spinning boxes 11. For example, on the same textile machine frame 15, single spinning units 3 can comprise spinning boxes 11, which produce thread according to the air spinning method and other spinning units 3 can comprise spinning boxes 11, which produce thread according to a rotor spinning method. For this, the textile machine frame 15 must be equipped with suitable connections for electrical power and compressed air as well as for exhaust air (not shown). Besides a central control unit 5, it is ^{advantageous} of advantage if the spinning unit 3 and the

winding ~~up~~ unit 4 are additionally interconnected through an exchangeable control unit 6. The exchangeable control unit 6 takes over the controlling of the individual spinning places, ^{the control unit 6} it especially controls and monitors the thread formation process on the spinning unit 3 and the transfer of the produced thread to the winding ~~up~~ unit 4. The
5 exchangeable control unit 6 is, in particular, able to consider the different delivery speeds of the different spinning units 3 for the winding ~~up~~ unit 4. That means, it is, in particular, able to control the delivery speeds, and/or production speeds, of the spinning units 3 and winding ~~up~~ units 4. Naturally, also the central machine control unit 5 can likewise be connected with the exchangeable control units 6 of the individual spinning places. Thus,
10 control signals, for example given by the operating personnel, can be delivered, from the central machine control unit 5 through the exchangeable control units 6 of the individual spinning places, to the individual machine units (spinning or winding ~~up~~ units). Such control signals ^{that} ~~which~~ are delivered through the central control unit 5 ~~are~~, for example, the start and stop of the entire spinning frame or the draft in the refinement
15 units (drafting units) of the spinning units.

Furthermore, it is likewise provided that the spinning unit 3 or also the winding ~~up~~ unit 4 ^{may include individual} ~~comprises own~~ control means 7 and 8. ^{specific to that unit} These provide for the implementation of the received control signals on the actually present machine units (for example, at the
20 spinning unit 3 the controlling of the motors ^{of a drive unit} 12 or of the spinning box 11). The control means of the spinning unit 3 ^{has} (in particular) to control a controlled starting up and switching off of the whole spinning unit 3. For this, a certain procedure can be provided.

In a preferred embodiment of the invention, the textile machine in each spinning place
25 or for each spinning place comprises one robot, which respectively is also ^a modular in the sense of the preceding conception ^{that is} (structured and exchangeable). During a machine stop, the robot 9, by means of an auxiliary thread, accomplishes a start up of spinning (piecing) or, if there is a thread break, joins the thread end of the bobbin with the new thread. It is also conceivable that the robot 9 serves several spinning places (with the
30 help of a not illustrated device for moving).

Preferably, the spinning units 3, in addition, comprise a refinement unit 10. The refinement unit 10 illustrated in the figure represents a drafting unit. It would, however, also be conceivable that, in place of the drafting unit 10, a dissolving roller is provided. Whether a refinement unit is used and which type, depends, in particular, on the succeeding spinning method applied in the spinning box 11. If the thread formation method is a rotor spinning method, then preferably a dissolving roller is used as a refinement unit. The actual thread formation process in the spinning unit 3 is performed in the spinning box 11. Preferentially, the modular structured and exchangeable spinning unit 3 comprises a spinning box which produces a thread according to the air spinning method. In addition, the invention is, however, also suitable in that different spinning units 3 can be applied with different spinning boxes 11. Thus, the spinning boxes 11 can, for example, produce thread according to a rotor spinning method, a friction spinning method, or also according to a false twist method.

The spinning unit 3 can also comprise a yarn sensor 16 and a thread sensor 17. As is illustrated in the figure, the spinning unit 3 and the winding up unit 4 preferably also comprise ^{separate, individual} their own drive units 12, and/or 13. The spinning units, and/or the winding up units, ^{with respect to the drives} are, thus, drive-technically independent. They only receive electrical power and control signals - if necessary also compressed air - through not shown plug-in connections and lines of the textile machine frame 15, and/or from the central machine control unit 5, and/or from the control unit ⁶ of the spinning place. The exchangeable units 3 and 4 thus comprise, for the substantial process steps, their own drive units ^{12 and 13} and are not attached, by means of mechanical couplings, to a central drive unit which would be positioned on the textile machine frame 15. ^{to} For the substantial process steps, which comprise their own drive units, ^{that} belongs the winding at the winding up unit 4, which comprises a drive unit 13 for the friction roller 18. ^{to} For the substantial process steps at the spinning unit 3, ^{that} belongs the refinement in the refinement unit (in the exemplified embodiment according to the figure, a drafting unit) and the draw-off from the spinning box. The spinning unit 3, therefore, ^{has} comprises two ^{individual} own drive units 12 for the rollers of the drafting unit and for the pair of draw-off rollers. The drives are preferably reluctance motors; however, further asynchronous motors could also be used. It is quite conceivable that for less important process steps, several units are provided with one

common drive unit. For example, several winding ~~up~~ units 4 can comprise a common drive unit for the traversing device 19 (mechanical force transmission by means of a shaft) ^{to} the most important process steps, which comprise ^{individual} ~~own~~ drive units or motors ~~belong~~ ^{as mentioned}, the refinement in the refinement unit 10 (drive units 12) as well as in the draw-off of the spinning unit 3 or the drive 13 of the friction roller 18 in the winding ~~up~~ unit 4. Depending on which type of spinning box 11 is used, the spinning unit 3 can possess yet another further drive unit (not shown) for the spinning box 11 (for example, for the rotor spinning method). The use of ^{individual} ~~own~~ drives for each unit - in particular for the substantial process steps - has several advantages. For example, no mechanical couplings, power transmissions, or gear transmissions are required. Thus, the individual spinning places are flexible and/or individually adjustable. The speed ratios can be adapted electrically, e.g., more easily (e.g., the draft in the refinement unit or the draw-off speed of the thread out of the spinning box). A ^{synchronization} ~~synchronisation~~ of the drive units in the spinning place can - if it should be necessary - be accomplished with the help of the control means 5 and/or 6. With the help of the ^{separate individual} ~~own~~ drives, it is ~~drive-~~ ^{simpler with respect to the drives} ~~technically also more simple~~ to run different spinning places and/or spinning units on the same textile machine frame at the same time.

The invention is particularly suitable for spinning units, which produce thread with an air spinning method. With this method, the thread formation takes place through air twisting. For this, the spinning box comprises in each case a fibre conveying channel with a fibre guide surface for guiding the staple fibre strand, at whose outlet a turbulence chamber is provided which, for its part, comprises a spindle with a thread guiding channel. The turbulence chamber contains a fluid device, which generates a turbulence stream (air) around the inlet opening of the thread guiding channel of the spindle. The fibre strand, and/or the thread are drawn off by the thread-guiding channel. The turbulence stream around the inlet opening of the thread guiding channel causes a twisting of the outer fibres of the staple fibre strand around its internal core during the drawing off of the longitudinal fibre formation. This way a thread is being produced from a staple fibre strand. Such a method is for example, disclosed in the patent document EP 854,214 (equivalent to US 5,927,026).

The invention is not limited to the embodiment according to the figure. This embodiment is rather meant as suggestion for the specialist, in order to realize the idea of the invention in a most favourable way. Further, favourable applications and combinations are, therefore easily, derivable ^{that} which, likewise, resemble the idea of the invention and ^{that} which are to be protected by this application. Some of the disclosed features in this description were described combined and are claimed combined in the following claims. It is, however, also conceivable, in application of the invention ~~thought~~ to claim individual features of this description on their own or in another combination. Therefore, the applicant expressly reserves the right, if necessary, to apply different combinations

10 in the application of the idea of the invention. *It will be appreciated by those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope of the invention. It is intended that the present invention include such modifications and variations as come within the scope of the appended claims and their equivalents.*

Summary

The invention relates to textile machines with several spinning places, whereby each spinning place comprises a can feeding means (2), a spinning unit (3) and winding up unit (4). The invention is based on the task to design the spinning places in such a manner, to minimize downtimes due to failures of machine components, or during re-fitting. According to the invention, such a spinning place is furnished with modularly structured and exchangeable spinning units (3) and/or winding up units (4).

Patent Claims

1. ~~Textile machine (1) with several spinning places, whereby each spinning place comprises a can feeding means (2), a spinning unit (3), and a winding up unit (4),~~
5 **characterized in that the spinning units (3) and/or the winding up units (4) are being**
modular structured and exchangeable.
2. Textile machine (1) according to claim 1, **characterized** in that the textile machine comprises a central machine control unit (5).
- 10 3. Textile machine (1) according to claim 1 or 2, **characterized** in that each spinning place comprises a modular structured, exchangeable control unit (6).
- 15 4. Textile machine (1) according to one of the claims 1 to 3, **characterized** in that the spinning unit (3) and/or the winding up unit (4) additionally comprise each an own control means (7,8).
- 20 5. Textile machine (1) according to one of the claims 1 to 4, **characterized** in that each spinning place comprises a modular structured exchangeable robot (9) for piecing or for the start of the spinning.
- 25 6. Textile machine according to one of the claims 1 to 5, **characterized** in that the spinning unit (3) comprises a refinement unit (10), whereby the refinement unit (10) is preferably a drafting unit (10) or a opening roller.
- 30 7. Textile machine (1) according to one of the claims 1 to 6, **characterized** in that the spinning unit (3) comprises a spinning box (11), which produces thread according to the air spinning method.
8. Textile machine (1) according to one of the claims 1 to 6, **characterized** in that the spinning unit (3) comprises a spinning box (11) which produces thread according

to one of the following methods: rotor spinning method, air spinning method, friction spinning method, false twist method.

- 5 9. Textile machine (1) according to one of the claims 1 to 8, **characterized** in that the spinning unit (3) is driven by its own motors (12) and for this comprises at least one own drive means (12), preferably a reluctance motor.
- 10 10. Textile machine according to one of the claims 1 to 9, **characterized** in that the winding up unit (4) is driven by its own motors (12) and for this comprises at least one own drive means (13), preferably a reluctance motor.
11. Spinning unit (3) for spinning frames (1), **characterized** in that the spinning unit (3) is modular structured and exchangeable.
- 15 12. Winding up unit (4) for spinning frames (1), **characterized** in that the winding up unit (4) is modular structured and exchangeable.
- 20 13. Spinning unit (3) or winding up unit (4) according to one of the claims 10 or 11, **characterized** in that the spinning unit (3) or the winding up unit (4) comprise an own control means (7, 8).
- 25 14. Spinning unit (3) according to one of the claims 11 or 13, **characterized** in that the spinning unit (3) comprises a refinement unit (10), whereby the refinement unit (10) is preferably a drafting unit (10) or a opening roller.
- 30 15. Spinning unit (3) according to one of the claims 11, 13, or 14, **characterized** in that the spinning unit (3) comprises a spinning box (11) which produces thread according to one of the following methods: air spinning method, rotor spinning method, friction spinning method, false twist method.

16. Spinning unit (3) according to one of the claims 11, or 13 to 14, **characterized** in that the spinning unit (3) is driven by its own motors (12) and for this comprises at least one own drive means (12), preferably a reluctance motor.

Reference list of numerals

	1	textile machine with several spinning places
	2	can-feeding means
5	3	spinning unit
	2	winding up unit
	3	central machine control unit
	4	exchangeable control unit
	5	control means of the winding up unit
10	6	control means of the spinning unit
	7	exchangeable and modular robot
	8	drafting unit
	9	spinning box
	10	drive of spinning unit
15	11	drive of winding up unit
	12	can
	13	textile machine frame
	14	yarn sensor
	15	thread sensor
20	16	friction roller
	17	traversing device